

Luhn Algorithm Implementation on Android in Credit Card Authentication

Lintang Yuniar Banowosari
Informatics Management
Gunadarma University
Jakarta, Indonesia
lintang@staff.gunadarma.ac.id

Nurhayati
Informatics Technology
Gunadarma University
Jakarta, Indonesia
yaz_aja@yahoo.com

Teuku Yunufa
Information System
Gunadarma University
Jakarta, Indonesia
yunufa@staff.gunadarma.ac.id

Abstract - High mobility of people who currently makes a person unable to perform any transaction in a bank or through another financial institution. One of the tools used in the transaction is a credit card. Taking the advantage of emerging technologies, it can be made an application that can provide information to credit card users about the authenticity of the credit card they have. By applying the concept of the Luhn algorithm can be made an application on the Android mobile phone operating system so it does not impede the mobility of its users. Luhn algorithm is an algorithm that is simple yet powerful enough to guarantee a credit card number is valid or not.

Keywords: Authentication, Credit Card, Luhn algorithm, Android.

1. INTRODUCTION

Credit cards are one type of plastic money as bank products are modified to meet the various needs of customers [2]. But viewed in terms of security, credit card security is still fragile. To be able to find out the validity of a digit credit card is needed a simple algorithm which Luhn algorithm. Because of the influence of information technology that drives greater demand for telecommunications services to create a society that informative, quick, precise, without blocking the mobility of users, therefore made an application to support the mobility of its users in

validating a credit card they have is on mobile phones based on Android.

2. CREDIT CARD

Credit card is the payment system in which the issuer card lending money to customers (cardholders) to be paid to the payee transactions with credit card (merchant). A credit card is different from a debit card, because credit cards do not remove or reduce the money from customer's account after the transaction. Almost all credit cards have the same shape and size, in accordance with ISO 7810 standard specifications [5].

2.1 Anatomy of Credit Card

Credit cards are more familiar with credit card or in the cyber world called CC is a plastic card containing a magnetic tape. Currently, chip equipped credit cards for more secure and easy to use. In figure 2.1 below will be explained about the anatomy of a credit card further.



Figure 2.1 Anatomy of a credit card

From figure 2.1 above can be explained the front of the credit card that consists of [1]:

1. *Card issuer*, the name of the bank as a credit card issuer.
2. *Credit card number*, amounting to 16 digits.
3. *Member since*, month and year to customers that credit card holders.
4. Name of credit card holders,
5. *Expiry date*, month and year of valid credit card.
6. Logo credit card network.

1. MII (Major Industry Identifier)

The first digit of a credit card number is the Major Industry Identifier (MII), which represents a category of companies that issue credit cards. MII represent different categories as in table 3.1.

Table 3.1 Categories of MII

MII Digit	Company Category
0	ISO/TC 68 and industry
1	Aviation company
2	Aviation company and industry
3	Travel and entertainment
4	Bank and financial
5	Bank and financial
6	Merchandizing and bank
7	Petroleum company
8	Telecommunication and industry
9	State enterprise

2. IIN (Issuer Identifier Number)

The first six digits on credit card numbers (including MII digit) form the issuer identifier, is number of publishers. This means the number of credit card issuers that may be is 106 or one million publishers. Some credit card issuers are well known and commonly used are as follows [3]:

Table 3.2 Category Issuer Identifier

Publisher	Identifier	Length of Credit Card
Diner's Club/Carte Blanche	300xxx-305xxx, 36xxxx, 38xxxx	14
American Express	34xxxx, 37xxxx	15
VISA	4xxxxx	13, 16
MasterCard	51xxxx-55xxxx	16
Discover	6011xx	16

3. Account Number

Digits to 7 (seven) up to (n - 1) of the credit card number is a unique account number. Maximum length of a credit card number is 16 digits. Because of 6 (six) first digit is the second and the last digit is the check digit, means the maximum length of the account number is 12 digits. So, there are 10^{12} or 1,000,000,000,000 possible account numbers.

4. Check Digits

The last digit of a credit card number is the check digit. Digits are used to check the validity of card numbers. The algorithm most commonly used to check the credit card number is the Luhn algorithm.

3. LUHN ALGORITHM

Luhn algorithm is an algorithm used to check the validity of a figure based on the digits that shape it. Check digit method requires 3 (three) steps to prove whether a card meets Luhn algorithm check digit, for a card with an even number of digits (example, Visa [16 digits], MasterCard [16 digits], and Novus [16 digits]) way as follows:

1. Each digit in an odd position (counting digits from the left with the far left is the 1st digit (D01, D02 ... D16)), multiply the value by 2 (two), if the result is more than 9, then the result is reduced by 9 (nine). Sum all the numbers that have been obtained it.
2. Each digit in the position is even, sum up the number value.
3. Sum step 1 and step 2, or in other words add the digits of the even and odd digits these steps 1. If the sum of the even-digit value plus the sum of step 1 the result is divisible by 10 (ten), means the card number is SAH or invalid.

3.1 Modulo arithmetic

Inside there is a Luhn algorithm called arithmetic modulo arithmetic operations. Modulo arithmetic (sometimes called clock arithmetic) is a system of arithmetic for integers where the second integer is operated until it reaches a certain value, namely the modulus (remainder). Suppose a is an integer and m is an integer > 0 . The operation $a \bmod m$ (pronounced "a modulo m") gives a remainder if divided by m . In other words, $a \bmod m = r$ such that $a = MQ + r$ with $0 \leq r < m$. Number m is called the modulus or modulo, and the results of arithmetic modulo m lies in the set $\{0, 1, 2, \dots, m-1\}$. Some examples of operations with the modulo operator, $6 \bmod 8 = 6$ (because $6 = 8 \cdot 0 + 6$), $-39 \bmod 13 = 0$ (because $-39 = 13(-3) + 0$). If $a \bmod m = 0$, then it is said that a is a multiple of m , which is a divisible by m . For example, $54 \bmod 6 = 0$, meaning 54 were multiples of 6^[4].

Example: **7889-8594-5435-5413**

Major Industry Identifier of this number is 7 (petroleum company), issuer identifier 788 985, account number 945435541, and its check digit is 3. We prove whether the number is valid or not. Here are the steps that must be executed:

Step 1:

Multiplying all odd digits by 2, if the result is more than 9, then the result is minus 9, then add the total. Separate first odd digits.

Then do the surgery times 2 and if the result is more than 9, then the net result of 9 then obtained:

$D01 = 7 \times 2 = 14$, because more than 9 then reduced to 9, $14 - 9 = 5$

$D03 = 8 \times 2 = 16$, because more than 9 then reduced to 9, $16 - 9 = 7$

$D05 = 8 \times 2 = 16$, because more than 9 then reduced to 9, $16 - 9 = 7$

$D07 = 9 \times 2 = 18$, because more than 9 then reduced to 9, $18 - 9 = 9$

$D09 = 5 \times 2 = 10$, because more than 9 then reduced to 9, $10 - 9 = 1$

$D11 = 3 \times 2 = 6$

$D13 = 5 \times 2 = 10$, because more than 9 then reduced to 9, $10 - 9 = 1$

$D15 = 1 \times 2 = 2$

Sum $D01 + D03 + D05 + D07 + D09 + D11 + D13 + D15 =$

$5 + 7 + 7 + 5 + 1 + 6 + 1 + 2 = 38$

Step 2:

Adding all the digits in even positions.

Step 3:

Sum the results of step 1 with the results of step 2 $= 38 + 42 = 80$.

Results from the sum of step 1 to step 2 divided by 10.

Or the results can be written, $80 \bmod 10 = 0$, the result is divisible by 10. And credit cards can be said to VALID.

4. SYSTEM DESIGN

Designing a system for implementing Luhn algorithm in determining the credit card authentication on the mobile phone based on Android will be illustrated through the following usecase diagram.

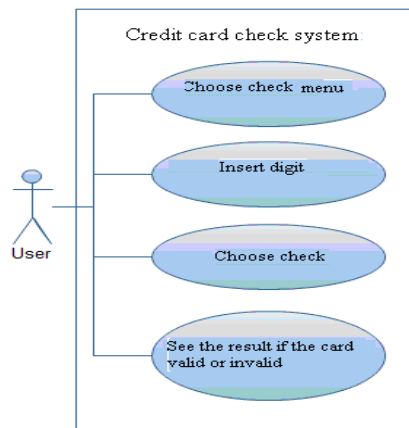


Figure 4.1 A usecase diagram

Connectedness between user and system can be seen in figure 4.1 usecase diagram above. Can be explained that in order to run the application, users enter their credit card digits have and will show the results of the digits of the credit card is valid or true to false for invalid.

5. IMPLEMENTATION

Here are given Luhn algorithm implementation so that it can be proved the authenticity of the credit card by using the Java programming language on a mobile phone based on Android.

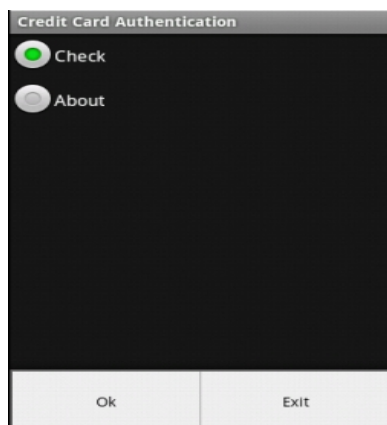


Figure 4.2 Display the main menu page

Figure 4.2 represents the first time the display when the application is run, there is a check menu option used to enter digits that want to prove their authenticity, and About menu that displays the profile creator application. Then to be able to

enter the digits you want to check, then select Check menu and it will appear as the image on figure 4.3.

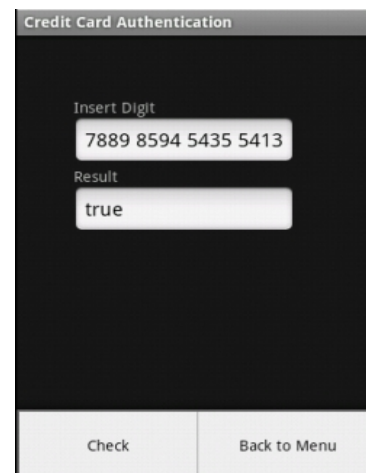


Figure 4.3 Display the results of verification of valid digits

Figure 4.3 describes the validity of the digits of a credit card so it can be said it is valid. By entering the digits contained in a credit card, for example here we enter the digits **7889 8594 5435 5413** then press check option, then the results are obtained based on the example above is true which means it is the correct digit and it is a valid digit.

6. CONCLUSION

The results of the research is the credit cards can be said valid if it meets the requirements of the Luhn algorithm that the end result is congruent with the mod 10. This means that if the results for the values that can not produce the rest of the card can be said is valid or invalid. But on the contrary, if the end result left the rest or not divisible by 10, the card can not be said illegal or invalid. Luhn algorithm is an algorithm that is quite powerful in validating credit card numbers and is the first step in preventing a crime to use credit cards. Luhn algorithm implementation in credit card authentication is built on the Android cellular operating system so it can be used

anywhere and anytime without blocking the mobility of its users.

7. REFERENCES

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